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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/735,862	12/12/2003	Hong Po	NU-208WO-1	3189
38731	7590	09/16/2005	EXAMINER	
NUFERN 7 AIRPORT PARK ROAD EAST GRANBY, CT 06026			PAK, SUNG H	
			ART UNIT	PAPER NUMBER
			2874	

DATE MAILED: 09/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	10/735,862	PO ET AL.	
	Examiner	Art Unit	
	Sung H. Pak	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-96 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-96 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Applicants' amendment filed 6/23/2005 has been entered. All pending claims have been carefully reconsidered in view of the amendment. However, the previous ground of rejection is maintained in this office action, and therefore the office action is made final. Please refer to Response to Arguments for details.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-29, 31-64, 66-71, 85-96 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacCormack et al (US 6,407,855 B1) as discussed in the previous office action.

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MacCormack discloses an optical fiber with all the limitations set forth in the claims, except it does not explicitly teach the use of more than two pairs of reflectors overlapping in a manner claimed in the instant application.

Specifically, MacCormack discloses a system comprising an optical fiber comprising a gain medium having a Raman active material with a Raman gain spectrum, the optical fiber being configured to receive energy at a pump wavelength λ_p (abstract); at least two pairs of reflectors disposed in the optical fiber, each pair of reflectors forming a resonance cavity with a resonance frequency, each resonance cavity having an index, the index of each resonance cavity being different than the index of the other resonance cavities (Fig. 4, column 8 lines 42-48); wherein for a resonance cavity having an index with a value M, M being an integer having a value of at least one, the resonance cavity has a resonance frequency (c/λ_{sm}) , where $\lambda_{sm}^{-1} = \lambda_p^{-1} - \Sigma_M \lambda_{tm}^{-1}$, wherein (c/λ_{tm}) is a frequency within the Raman gain spectrum of the Raman active material contained in the gain medium and c is the speed of light (column 5 lines 4-19); and for a resonance cavity having an index with a value N, N being an integer having a value of at least 2, the resonance cavity has a resonance frequency (c/λ_{sn}) , the resonance cavity having the index with the value N overlapping only with a resonance cavity having a resonance frequency $(c/\lambda_{s(n-1)})$ and with a resonance cavity having a resonance frequency $(c/\lambda_{s(n+1)})$ wherein the resonance cavity having the highest value for N overlaps with at most one other resonance cavity (Fig. 4 and column 8 line 42- column 9 line 3); wherein at least one pair of reflectors has a first reflector and a second reflector, the first reflector being disposed in the optical fiber closer to a point where energy at wavelength λ_p enters the optical fiber than the second reflector, the second reflector being configured to reflect only a portion of energy impinging thereon at the resonance

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frequency for the resonance cavity formed by the at least one pair of reflectors (column 8 line 42- column 9 line 3); wherein the first reflector is configured to reflect substantially all energy impinging thereon at the resonance frequency for the resonance cavity formed by the at least one pair of reflectors, and the second reflector is configured to partially reflect of the energy impinging thereon so that it acts as an output coupler (column 8 lines 42- column 9 line 3); wherein there is an additional reflector disposed in the optical fiber, the additional reflector being configured to reflect energy impinging thereon at wavelength λ_p (Fig. 4); wherein at least one of the pairs of reflectors comprise pairs of Bragg gratings (column 5 lines 35-36).

Regarding claims 88-91, MacCormack discloses controlling the power of output wavelength relative to the power of the pump wavelength (column 6 lines 5-24).

Regarding claims 13, 21, 54, MacCormack discloses the use of wavelength tunable reflectors (column 2 lines 28-29).

Regarding claims 22, 23, 55-57, MacCormack discloses the use of long period grating for suppressing formation of energy at frequency in Raman gain spectrum of the active material in the gain medium in the fiber (column 6 lines 5-24).

However, MacCormack discloses the use of two pairs of reflectors in this configuration (Fig. 4). Nevertheless, it is well known and common in the art to use three or more pairs of reflective gratings in Raman fiber lasers. Plurality of pairs of reflective gratings provide plurality of resonance cavities which enable the fiber laser to output plurality of wavelengths for more robust optical applications. Therefore, it would have been obvious to a person of ordinary

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skill in the art at the time the invention was made to modify the MacCormack device to have more than three pairs of reflective gratings.

Claims 30, 65, 72-84 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacCormack et al (US 6,407,855 B1) in view of Dianov et al ("Three-cascaded 1407-nm Raman Laser Based on Phosphorus-doped Silica Fiber"), as discussed in the previous office action.

Dianov was cited in the information disclosure statement.

MacCormack discloses an optical fiber device with all the limitations set forth in the claims as discussed above, except it does not explicitly teach the use of GeO_2 and/or P_2O_5 as Raman active materials.

Dianov, on the other hand, explicitly teaches the use of GeO_2 and P_2O_5 as Raman active materials in optical fiber lasers (abstract). It is taught that the use of GeO_2 and P_2O_5 are advantageous and desirable because the resulting optical fiber lasers are able to generate optical signal with desirable wavelengths with few number of conversion cascades (page 402, paragraph 3). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the MacCormack device to have GeO_2 and P_2O_5 as Raman active materials.

Response to Arguments

Applicant's arguments filed 6/25/2005 have been fully considered but they are not persuasive.

Independent claims 1, 34, 69, 92 and 95:

Applicants' arguments

Starting on page 3 of the applicants' response, it is argued that "MacCormack fails to establish a prima facie case of obviousness." (page 3, first paragraph) And, it is argued that "... there is less motivation to provide, from "thin air", an additional pair of reflectors to Figure 4 of MacCormack ... than there was to substitute one detector for another in the system of In Re Fine... Accordingly, it is respectfully submitted that MacCormack fails to establish a prima facie case that the above noted claims are obvious, as there is no proper motivation to modify MacCormack." (page 4, first and second paragraphs).

Further, it is argued that "It is not appropriate for the examiner to take official notice of facts without citing a prior art reference where the fact asserted to be well-known is not 'capable of instant and unquestionable justification as being well-known'". (page 4, third paragraph citing MPEP § 2144.03) Applicants argue that "Raman phenomena is sufficiently esoteric such that citation to a standard work is necessary to support the assertion being relied upon." (page 4, third paragraph).

Examiner's findings

First, the examiner respectfully submits that MacCormack teaches all the structural features and elements of the claimed invention, except it teaches the use of two pairs of reflectors, instead of three pairs of reflectors as claimed in the instant application. (please refer to the ground of rejection provided in the previous office action, and maintained by this office action for 'element-by-element' analysis). Specifically, MacCormack teaches two pairs of over-

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lapping reflectors forming two Raman resonance cavities having two resonance wavelengths (Fig. 4 and column 9 lines 3-12). MacCormack clearly teaches why such overlapping resonance cavity configuration is advantageous over the prior art (column 9 lines 13-29). Thus, the patentability of pending claims of the instant application hinges on the only difference between the claimed invention and the invention taught by MacCormack, i.e. the use of three pairs of reflectors, instead of two pairs.

The examiner maintains that “it is well known in the art at the time the invention was made” to use three pairs (or more) of reflectors in Raman fiber amplifier/ laser device, and that such fact is “capable of instant and unquestionable justification as being well-known.”

Contrary to applicants’ assertion, Raman Phenomena are widely known and understood in the art. A cursory search of class 385 (Optical waveguide/ Optical fibers) of the US Patent Classification reveals 1,218 documents discussing Raman phenomena (as of September 4th, 2005). For example, a laser excited Raman spectrometer was known in the art as early as January of 1971 (US Patent 3,556,659). Further more, a use of three or more pairs of reflectors, each pair corresponding to a unique wavelength, is discussed and taught by numerous patent documents since the discovery of the Raman phenomena. Some of the recent examples include:

US Pat. 5,323,404- Figs. 1, 2, 4;

US Pat. 5,982,791- Figs. 1, 3;

US Pat. 6,163,552- Figs. 1, 3, 4;

US Pat. Application Publication 2001/0010696 A1- Figs. 1-2 ;

US Pat. Application Publication 2005/0078715 A1- Fig. 1;

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US Pat. Application Publication 2005/0100280 A1- Figs. 5-8;

As well as foreign patent documents such as:

Canadian patent document CA 2,282,943- Figs. 1-2;

European Patent Application EP 1,349,242 A1- Fig. 2;

European Patent Application EP 1,124,295 A2- Fig. 1-2;

Etc.

All of these patent documents describe Raman phenomena, and specifically the use of varying numbers of reflector pairs forming resonance cavities, each corresponding to a unique resonance wavelength. Thus, based on the “substantial evidence” standard (MPEP § 2144.03), it is determined that “the use of three or more pairs of reflectors” is capable of instant and unquestionable justification as being well-known.

Second, the examiner respectfully submits that the proper motivation for modifying the device of MacCormack in view of a well-known teaching (of having three or more pairs of reflectors) was clearly set forth in the previous office action, as well as this office action. MPEP § 2144 explicitly states, “The rationale to modify or combine the prior art *does not have to be expressly stated in the prior art*, the rationale may be expressly or impliedly contained in the prior art *or it may be reasoned from knowledge generally available to one of ordinary skill in the art*, established scientific principles, or legal precedent established by prior case law. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)”. (emphasis added)

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As discussed above, the list of example US patent and foreign patent documents clearly teach the advantage of having plurality of resonance cavities for producing multiple wavelength optical signals. Multiple wavelengths signals allow for high density, high bandwidth optical communications. Therefore, the advantage of having three or more pairs of reflectors is commonly known and ‘generally available to one of ordinary skill in the art’, and a prima facie case of obviousness had been established.

In accord with MPEP 2144.03, subsection E, “Any rejection based on assertions that a fact is well-known or is common knowledge in the art without documentary evidence to support the examiner’s conclusion should be judiciously applied.” In the instant case, the examiner maintains that the use of the Official Notice (or the assertion of a well-known fact) was judiciously applied after a careful and thorough consideration of the evidence before the examiner.

Claims 88 and 89:

It is argued that McCormick fails to establish a prima facie case of obviousness for claims 88 and 89, because it fails to disclose a ratio of output power at output wavelength to a power received by the optical fiber at the pump wavelength being at least about 20% of the theoretical limit (page 5, third paragraph).

The examiner respectfully submits that MacCormick explicitly teaches controlling the power of output wavelength relative to the power of the pump wavelength (column 6 lines 5-24). As such, the ratio being 20% of the theoretic limit is inherently met by the operation of the MacCormick device.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sung H. Pak whose telephone number is (571) 272-2353. The examiner can normally be reached on Monday- Friday, 9AM-5PM.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Sung H. Pak
Patent Examiner
Art Unit 2874

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